

Fig. 1

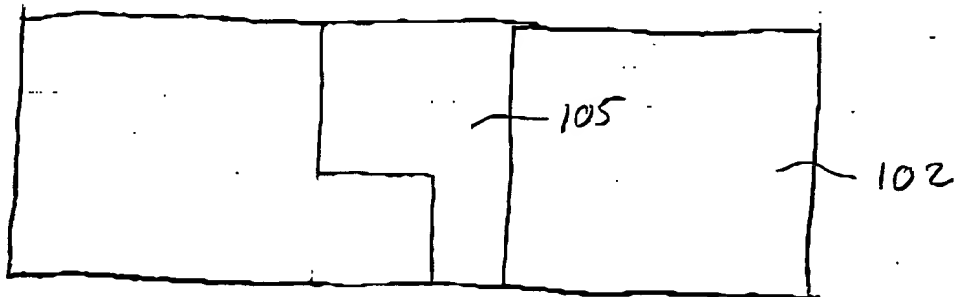


Fig. 2

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Form a copper layer overlying a patterned dielectric layer

Form a doped layer superjacent the copper layer

Thermally drive dopants from doped layer into copper layer
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Fig. 3

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Form a copper layer overlying a patterned dielectric layer
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Remove excess metal so as to form individual copper interconnect lines
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Implant dopants into at least the interconnect lines
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Fig. 5

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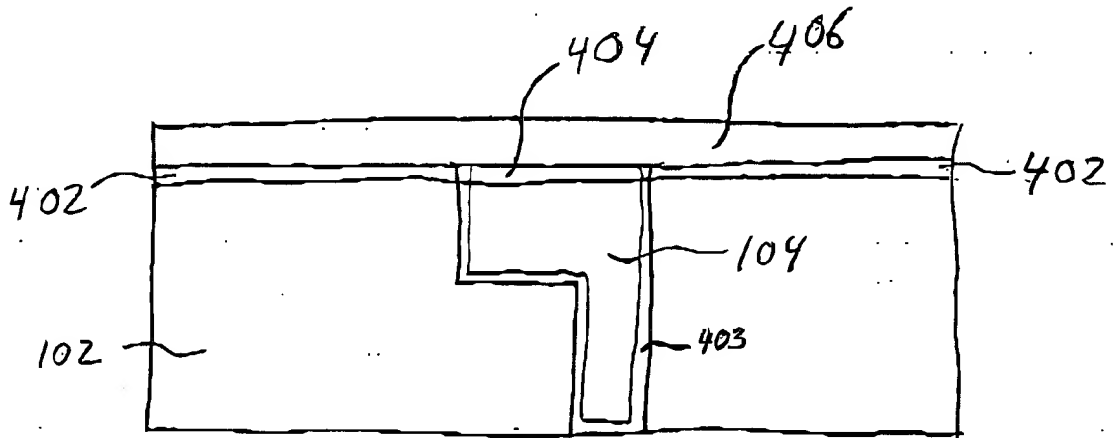


Fig. 4

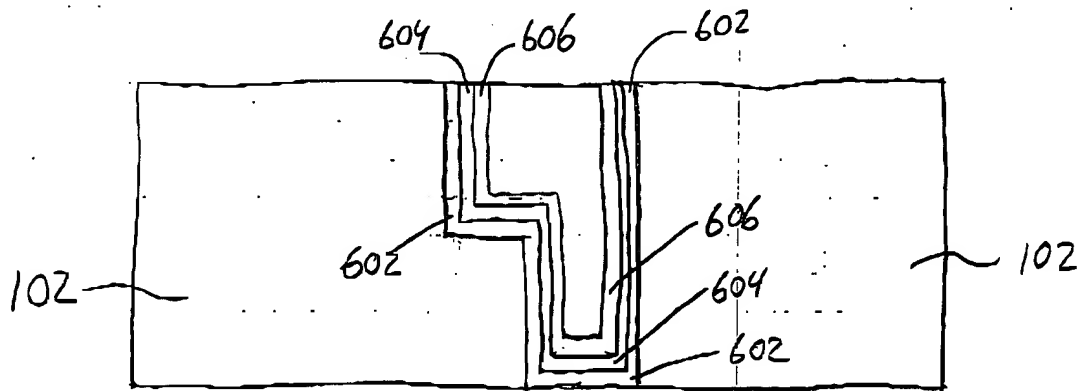


Fig. 6

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Pattern a dielectric layer to form at least trenches therein

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Form a copper-diffusion barrier over the surfaces of the patterned dielectric layer

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Deposit a doped seed layer over the barrier layer

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Deposit a capping layer over the doped seed layer without exposing the doped seed layer to the atmosphere

Fig. 7

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Pattern a dielectric layer to form at least trenches therein
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Form a copper diffusion barrier over the surfaces of the patterned dielectric layer

Deposit a doped seed layer over the barrier layer

Deposit a capping layer over the doped seed layer without exposing the doped seed layer to the atmosphere

Deposit a copper layer over the capping layer

Thermally drive dopants from doped seed layer to upper portions of copper layer while providing atmosphere that reacts with dopant species

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